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REVISION OF THE LEMMINGS OF THE GENUS *SYNAPTOMYS*, WITH DESCRIPTIONS OF NEW SPECIES.

BY DR. C. HART MERRIAM.

The genus *Synaptomys* has an interesting history. It was described by Professor Baird about forty years ago from a specimen received from William Cooper, of Hoboken, New Jersey, for whom the species was named *Synaptomys cooperi.*[1] The locality at which it was collected is unknown. For many years the species continued to elude the notice of naturalists, and it was not until 1874 that additional information was published concerning it. In this year Coues recorded specimens from Indiana, Illinois, Minnesota, and Kansas. He also mentioned specimens from Oregon [= Washington] and Alaska; but these, as will be shown later, do not belong to the present species.[2]

In 1881 Dr. F. W. Langdon recorded its occurrence "in numbers" at Brookville, Indiana, and described the locality at which it had been found by E. R. Quick.[4]

In 1885 Edgar R. Quick and Amos W. Butler described its habits as observed at Brookville, Indiana.[5]

In December, 1892, I published a notice of the occurrence of the species on Roan Mountain, North Carolina, and of the discovery of its remains in 'pellets' of the long-eared owl found in Virginia, near Washington, D. C., by Dr. A. K. Fisher, and of others taken from the stomachs of hawks and owls killed at Sandy Spring, Maryland, and Alfred Center, New York.[6] At the close of this paper I suggested that mammal collectors would "do well to keep a sharp lookout for this species in the cooler parts of Pennsylvania and New Jersey."

In January, 1893, S. N. Rhoads recorded the species from May

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[1] The numeral references in the present paper refer to titles in the bibliography at the end of the article.

Landing, New Jersey, but unfortunately gave it a new name, *Synaptomys stonei.**[7] In the same year (1893) J. B. Steere recorded it from Ann Arbor, Michigan.[8]

In April, 1894, Outram Bangs recorded specimens from Wareham and Plymouth, Massachusetts, and showed that *S. stonei* is the same as *S. cooperi* Baird.[9]

In December, 1894, J. A. Allen recorded the northward extension of *Synaptomys* to Andover and Gulquac Lake, New Brunswick.[12]

Early in January, 1895, S. N. Rhoads published a record of the capture of a specimen of *S. cooperi* on Big Bushkill creek, Monroe county, Pennsylvania.[13] This completes, so far as I am aware, the published records of the type species.

Although remains of the species had been found both in 'pellets' and stomachs of hawks and owls from the vicinity of Washington, D. C., and although the species had been persistently trapped for by a number of experienced mammal collectors, still no specimen 'in the flesh' was actually obtained until February of the present year (1896), when Vernon Bailey captured several in a sphagnum bog at Hyattsville, Maryland, only seven miles from Washington. Mr. Bailey has also secured a number at Elk River, Minnesota, and I have a specimen from Knoxville, Iowa.

During recent explorations in the great Dismal Swamp in southern Virginia, Dr. A. K. Fisher secured specimens of a new *Synaptomys*, which is here described under the name *S. helaletes.*

Specimens collected at Neosho, Kansas, many years ago by the late Captain B. F. Goss, and labeled *S. gossii* by Baird, are here described as a subspecies under that name.

A few months ago Napoleon A. Comeau, of Godbout, on the north shore of the St. Lawrence, near the Gulf, sent me a specimen of *Synaptomys* which differs materially from *S. cooperi.* This animal has just been described by Outram Bangs under the name *S. fatuus*, from specimens collected by him at Lake Edward, Quebec.[14] Dr. Allen's New Brunswick specimens, which he has kindly loaned me for examination, also belong to this northern form. It is not improbable that all of the four forms here recognized will be found to intergrade.

In 1894 F. W. True described a new lemming mouse collected by Lucien M. Turner at Fort Chimo, Ungava, and named it *Mic-*

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*In the same paper Mr. Rhoads stated that the species "had previously been detected by the U. S. Department of Agriculture in the rejects of a barn owl living in the tower of the Smithsonian Institution" (Am. Nat., Jan., 1893, 53). This statement was unauthorized and incorrect.

tomys innuitus.[10] The characters that separate it from *Synaptomys* proper seem of subgeneric rather than generic weight, and in the present paper *Mictomys* is treated as a subgenus of *Synaptomys.*

In 1874,[2] and again in 1877,[3] Coues referred to *Synaptomys cooperi*, a specimen from Skagit valley, Washington, collected in 1859 by C. B. Kennerly, and one from Nulato, Alaska, collected in 1867 by William H. Dall. These specimens are still in the U. S. National Museum, and through the courtesy of Mr. True I have been enabled to compare them with his type of *Mictomys innuitus*, which they closely resemble. Both belong to the subgenus *Mictomys*, but differ sufficiently from *innuitus* and from each other to warrant separation. They are here described under the names *truei* and *dalli.*

In September, 1895, Clark P. Streator collected, at Wrangel, Alaska, still another member of the same group, which is here named *wrangeli.*

Summary.—The material now available shows that the genus *Synaptomys*, instead of being monotypic, as until recently supposed, comprises 2 well marked subgeneric groups—*Synaptomys* proper and *Mictomys;* that *Synaptomys* proper inhabits eastern Canada and the northeastern United States from Minnesota to New Brunswick and New England, and contains 4 fairly well defined forms; that *Mictomys* has a transcontinental distribution from Labrador to Alaska, and contains at least 4 species.

Synaptomys, like the other genera of lemmings, is a distinctly boreal group. Of the two subgenera, *Mictomys* is decidedly the more boreal, being strictly confined, in the east at least, to the Hudsonian zone. The subgenus *Synaptomys* pushes southward to the northern edge of the Austroriparian zone, but after it leaves the Boreal zone it occurs only, so far as known, in cool swamps.

Genus SYNAPTOMYS Baird.

Subgenus *Synaptomys* Baird, 1857.

Inferior molars with well defined closed enamel loops on outer side; upper incisors very broad and heavy, with enamel face deep orange throughout; posterior end of palate without median azygos ridge or projection.

Subgenus *Mictomys* True, 1894.

Inferior molars with no closed enamel loops on outer side; upper incisors relatively narrow and weak, with enamel face pale yellow and part on outer side of sulcus nearly white; posterior end of palate with a strongly marked median azygos ridge and projection.

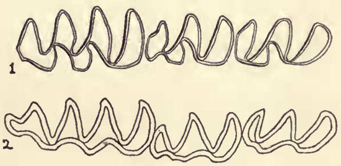

FIG. 1.—Enamel pattern of lower molars.
1. *Synaptomys* 2. *Mictomys.*

Subgenus SYNAPTOMYS Baird.

Synaptomys cooperi Baird.

Synaptomys cooperi Baird, Mammals N. Am., pp. 556–558, 1857.
Coues, Proc. Acad. Nat. Sci., Phila., p. 194, 1874; Monog. N. Am. Rodentia, pp. 235–236, 1877.
Quick and Butler, Am. Naturalist, XIX, 113–115, Feb., 1885.
Merriam, Proc. Biol. Soc. Wash., VII, 175–177, Dec., 1892.
Bangs, Proc. Biol. Soc. Wash., IX, 99–104, April, 1894.
Synaptomys stonei Rhoads, Am. Naturalist, XXVII, pp. 53–54, Jan. 11, 1893.

Type locality unknown; probably northern New Jersey or southern New York.

Geographic distribution.—Boreal and parts of Transition zones from Minnesota eastward to eastern Massachusetts and south to Iowa, Indiana, and Maryland, and in the mountains to North Carolina and Tennessee. South of the Boreal zone it appears to be confined to cold sphagnum swamps, which give it a boreal atmosphere.

General characters.—Similar in size and general appearance to *Microtus pennsylvanicus*, but tail very much shorter. Contrasted with *Synaptomys helaletes* the feet are smaller and the rostrum, mandible, and upper incisors are much narrower and less massive.

Color.—Upper parts grizzled gray and yellowish brown abundantly mixed with black-tipped hairs; under parts soiled whitish, the plumbeous under fur showing through; tail bicolor; brownish above, whitish below. In the adult the color of the back varies from pale yellowish brown to almost rusty, always 'grizzled' by a bountiful admixture of black-tipped hairs. In the young the color is at first very dark, almost blackish slate; it then becomes grayish brown and approaches sepia before taking on the yellowish brown of the adult.

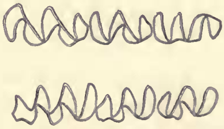

FIG. 2.—Enamel pattern of upper and lower molars in *Synaptomys cooperi.*

Cranial and dental characters.—Contrasted with *S. helaletes* from Dismal Swamp, the skull and teeth of *S. cooperi* are smaller and weaker, the zygomata more bowed outward, the rostrum and mandible very much narrower, the nasals narrower posteriorly, and the brain case shorter.

Measurements.—Average of 4 specimens from Ann Arbor, Michigan: total length, 118; tail vertebræ, 17.5; hind foot, 18. Average of 2 from Roan Mountain, North Carolina: Total length, 121; tail vertebræ, 20; hind foot, 19.5.

Synaptomys fatuus Bangs.

Synaptomys fatuus Bangs, Proc. Biol. Soc. Wash., X, 47–48, March 7, 1896.

Type locality.—Lake Edward, Quebec.

Geographic distribution.—Hudsonian zone from Lake Edward, Quebec (and probably much farther west), to Victoria county, New Brunswick, and Godbout, Quebec. Limits of range unknown.

General characters.—Similar to *S. cooperi*, but slightly smaller; skull decidedly smaller, with much narrower upper incisors.

Color.—Upper parts grizzled yellowish brown, abundantly mixed with black-tipped hairs; under parts varying from slate gray to whitish, washed with buff on the belly; tail nearly concolor, only slightly paler below than above.

Cranial and dental characters.—Skull similar to that of *S. cooperi*, but smaller and weaker; rostrum narrower; basisphenoid broader posteriorly. Upper incisors very much narrower than in *cooperi*.

Measurements.—Average of 2 adults from type locality (measured in flesh by O. Bangs): total length, 124; tail vertebræ, 18; hind foot, 18.7. Measurements of an alcoholic specimen (♀) from Godbout, Quebec: total length, 106; tail vertebræ, 19; hind foot, 18.

Synaptomys helaletes sp. nov.

Type from Dismal Swamp, Virginia, No. 75172, ♀ adult, U. S. National Museum, Department of Agriculture collection. Collected October 14, 1895, by Dr. A. K. Fisher. Original number 1818.

General characters.—Similar to *S. cooperi*, but with larger head and feet, longer tail, much broader rostrum and mandible, and larger and more massive skull and teeth.

Color.—Upper parts grizzled gray and yellowish brown, abundantly mixed with black-tipped hairs; under parts plumbeous, washed with white; tail bicolor, brownish above, whitish below; toes usually partly white.

Cranial and dental characters.— Contrasted with *S. cooperi*, the skull and teeth are larger, heavier, and more massive; the zygomata less strongly bowed outward; the nasals broader posteriorly, and the brain case longer. The rostrum, upper incisors, and under jaw are remarkable for breadth and massiveness.

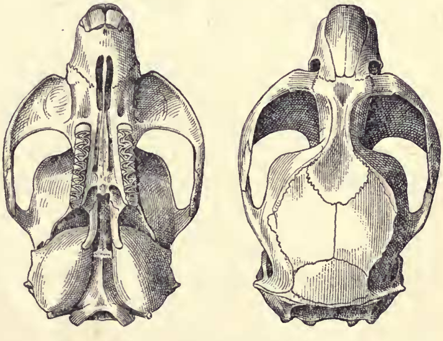

FIG. 3.—Skull of *Synaptomys helaletes* ♀ (type) × 1½.

Measurements.—Type specimen: total length, 125; tail vertebræ, 22; hind foot, 20. Average of four adults from type locality: total length, 118.5; tail vertebræ, 21; hind foot, 20.2.

General remarks.—*Synaptomys helaletes*, while of essentially the same size as *S. cooperi*, has very much larger fore and hind feet and a longer tail. The difference in the breadth and massiveness of the rostrum, mandible, and upper incisors is so great that skulls of the two require no comparison. Still, specimens recently collected by Vernon Bailey in a sphagnum swamp near Washington, D. C., are somewhat intermediate and indicate that intergradation may exist.

Synaptomys helaletes gossii subsp. nov.

Arvicola (*Synaptomys*) *gossii* Baird MS., Coues, Monog. N. Am. Rodentia, p. 235, 1877 (*nomen nudum*).

Type locality.—Neosho Falls, Kansas, No. 6915, ♂ old, U. S. National Museum. Collected by B. F. Goss, 1866.

General characters.—Similar to *S. helaletes*, but color probably redder; rostrum longer; audital bullæ smaller.

Color.—Not positively known; probably more reddish brown than in *cooperi* or *helaletes*. The mounted specimen in the National Museum has been skinned out of alcohol, and the skins originally collected by Captain Goss cannot be found.

Cranial and dental characters.—Skull as a whole similar to that of *S. helaletes*, but even larger, with rostrum and nasals longer; zygomata more bowed outward in the middle; orbital fossæ larger; audital bullæ smaller; postpalatal pits deeper, defining a distinct median ridge between them, which ridge projects slightly into the postpalatal notch. Viewed from below, the rostrum and incisive foramina are conspicuously longer. Owing to the small size of the audital bullæ, the sides of the basioccipital are less deeply excavated, and the vacuity on each side of the basisphenoid is much larger than in *helaletes*; the incisors are very broad and heavy, as in *helaletes*, and the molars nearly as large (the upper series measuring 7 mm.).

Measurements.—Average of 6 specimens from type locality: total length, 120; tail vertebræ, 20.5; hind foot, 19.*

Subgenus MICTOMYS True.

A new and exceedingly interesting lemming-vole from Ungava, Labrador, was described by Mr. F. W. True, in 1894, under the name *Mictomys innuitus*. On comparing the type specimen of this species and specimens of the two related species here described, with *Synaptomys cooperi*, it appears that the most important character separating *Mictomys* from *Synaptomys* is the absence of closed triangles or enamel loops on the outer side of the lower molars (Fig. 1). In addition, the upper incisors in *Mictomys* are more slender and much paler in color, and the part exterior to the sulcus is nearly white, while in *Synaptomys* the whole enamel face is deep orange. The chief cranial differences are in the post-palatal region. In *Mictomys* there is a distinct median azygos ridge not present in *Synaptomys*,† where the palate breaks down to the interpterygoid notch. This ridge separates the post-palatal pits and projects backward into the post-palatal notch. In *Mictomys* the supraorbital ridges unite in a single median ridge; in *Synaptomys* they are normally separated by a sulcus.

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* Hind foot from alcoholics; the other measurements taken in flesh by Captain Goss and converted from Coues' table, N. Am. Rodentia, p. 236, 1877.

† Except in *S. gossii* in which the post-palatal pits are so deep that the median part of the palate between them is left as a nearly vertical projection comparable to, but much shorter than, that of *Mictomys*.

The differences in enamel pattern of the molar teeth in the four species of *Mictomys* now known are shown in the accompanying illustration (Fig. 4). The teeth are large and broad in *M. innuitus* and *dalli*; smaller and much narrower in *wrangeli* and *truei*. The reëntrant angles on the outer side of the lower molars are deepest in *truei* (*d'*); shallowest in *wrangeli* (*b'*).

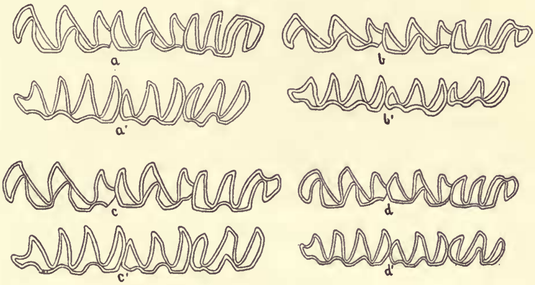

FIG. 4.—Enamel pattern of molar teeth in type specimens of *Mictomys*. × 5.

a, *b*, *c*, *d*, upper series; *a'*, *b'*, *c'*, *d'*, lower series.
a. *Mictomys innuitus*, Ft. Chimo, Ungava.
b. *Mictomys wrangeli*, Wrangel, Alaska.
c. *Mictomys dalli*, Nulato, Alaska.
d. *Mictomys truei*, Skagit Valley, Washington.

Synaptomys (Mictomys) innuitus True.

Mictomys innuitus True, Proc. U. S. Nat. Mus., XVII, 243, April 26, 1894.

Type locality.—Fort Chimo, Ungava, Labrador.

General characters.—Size and general appearance similar to *Synaptomys cooperi;* ear slightly longer than in *Synaptomys;* tail shortest of the four known species of *Mictomys*.

Color (of alcoholic).—"Upper surfaces grayish brown, as in *Synaptomys;* under surfaces gray; face pale brown; lips, end of nose, and chin white; feet pale brown; tail bicolored, pale brown above, white below." From continued immersion in alcohol the color of the upper parts has now changed to reddish brown.

Cranial and dental characters.—Skull as a whole very broad and flat; brain case strongly depressed; zygomata broadly spreading and standing out squarely from rostrum; audital bullæ strongly inflated anteriorly, the anterior border strongly convex forward. Contrasted with *M. wrangeli*, the posterior loop of the last upper molar is longer transversely, and the reëntrant angles of the middle and last lower molars are deeper.

Measurements of type specimen (alcoholic, measured by C. H. M.).—Total length, 115; tail vertebræ, 17; hind foot, 17.5.

Synaptomys (**Mictomys**) **dalli** sp. nov.

Type locality.—Nulato, Alaska, No. 10957, ♂ adult [skeleton from alcohol], U. S. National Museum. Collected February, 1867, by Wm. H. Dall.

General characters.—Similar to *M. wrangeli*, but differing in cranial characters.

Color.—Unknown.

Cranial and dental characters.—Skull similar to that of *wrangeli*, but differing in the following particulars: nasals emarginate instead of truncate posteriorly; interparietal much narrower anteroposteriorly and acute at both ends; brain case broader; interorbital constriction broader; zygomatic expansion slightly larger; *audital bullæ much larger* and more fully inflated, with corresponding reduction in breadth of basioccipital and basisphenoid; *mandible conspicuously larger, broader, and heavier*, particularly as seen from below; upper and lower molars conspicuously larger; middle and last lower molars with reëntrant angle on outer side decidedly deeper than in *wrangeli*, and thus resembling *truei;* posterior loop of last upper molar as in *wrangeli.*

Measurements (estimated from skeleton).—Total length, 115; tail vertebræ, 22; hind foot, 19.

General remarks.—In looking at the skull of *M. dalli* from above and comparing it with the type of *M. wrangeli*, the only conspicuous differences are the greater breadth of the brain case and interorbital constriction. Looked at from below, the large size of the audital bullæ and molar teeth is striking. On comparing the under jaws, one is also impressed by the disproportionally large size of the mandible and molars of *dalli.* I have named the species in honor of Dr. William H. Dall, who collected it at Nulato, Alaska, nearly thirty years ago.

Synaptomys (**Mictomys**) **truei** sp. nov.

Type from Skagit Valley, Washington, No. ${}^{3798}_{12101}$, yg. ad., U. S. National Museum. Collected August 6, 1859, by Dr. C. B. Kennerly (probably in mountains bordering Skagit valley).

General characters.—Size and general appearance as in *S. wrangeli*, but ears slightly longer and color of upper parts more reddish brown. Last lower molar with a deep reëntrant angle on outer side.

Color.—Upper parts dull umber brown fading gradually to plumbeous of under parts; belly hairs tipped with whitish. Tail bicolor, dark above, whitish below. The type and only known specimen is in the molt and in very poor condition; hence the colors may not be as in the living animal.

Cranial and dental characters.—The skull of the type is nearly destroyed, leaving only the teeth in the broken jaws. The molar loops, both above and below, are much fuller and more bluntly rounded than in *innuitus* and *wrangeli*, and the reëntrant angle on the outer side of the last lower molar is much deeper and nearly forms a closed loop on the outer side of that tooth. The upper incisor is narrower and the sulcus shallower than in the other known species.

Measurements (from dry skin).—Total length, about 112; tail vertebræ, 22; hind foot, 18.

General remarks.—Mictomys truei differs markedly from the two other species now known in the fullness of the molar loops and the depth of the reëntrant angle on the outer side of the last lower molar. I have named the species in honor of Mr. F. W. True, curator of mammals in the U. S. National Museum.

Synaptomys (Mictomys) wrangeli sp. nov.

Type from Wrangel, Alaska, No. 74720, ♂ ad., U. S. National Museum, Department of Agriculture collection. Collected September 6, 1895, by Clark P. Streator. Original number 4871.

General characters.—Similar to *S. innuitus*, but larger; tail and hind foot longer; skull narrower.

Color.—Upper parts grizzled grayish brown, with a yellowish cast; under parts plumbeous, tippid with whitish; tail bicolor, brownish above, whitish below, darker at tip.

Cranial and dental characters.—The skull of *Mictomys wrangeli*, contrasted with that of *M. innuitus*, is narrower and higher; the zygomata narrower and less spreading anteriorly; brain case narrower and less depressed; audital bullæ less inflated anteriorly. The posterior loop of the last upper molar is much shorter; the reëntrant angle on outer side of last lower molar shallower, and the enamel folds of all the teeth more loosely spaced.

Measurements (taken in flesh).—Type specimen: total length, 122; tail vertebræ, 23; hind foot, 19. Average of two specimens from type locality: total length, 119.5; tail vertebræ, 22.5; hind foot, 19.

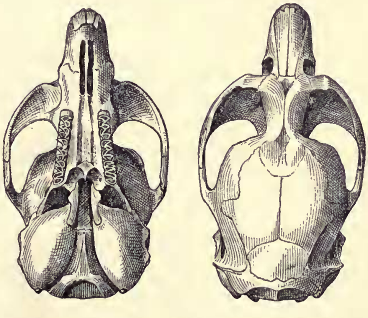

FIG. 5.—Skull of *Mictomys wrangeli* ♂ (type) × 1½.

BIBLIOGRAPHY.

Titles of Papers Containing Original Matter Relating to the Genus Synaptomys.

1. 1857. Baird, Spencer F.—Mammals of North America, 1857. Original description of genus *Synaptomys* and species *S. cooperi* (pp. 556–558).

2. 1874. Coues, Elliott.—Synopsis of Muridæ. <Proc. Acad. Nat. Sci., Phila., pp. 173–196, 1874. Description and record of localities (pp. 192–194).

3. 1877. Coues, Elliott.—Monographs of North American Rodentia, 1877. General description of genus *Synaptomys* and species *cooperi* (pp. 228–236).

4. 1881. Langdon, Frank W.—The Mammalia of the vicinity of Cincinnati. <Jour. Cincinnati Soc. Nat. Hist., vol. iii, pp. 297–313, Jan., 1881. Detailed information respecting the locality in which *Synaptomys cooperi* was found by E. R. Quick near Brookville, Indiana (pp. 307–308).

5. 1885. Quick, Edgar R., and Butler, Amos W.—The Habits of some Arvicolinæ. <Am. Naturalist, xix, pp. 113–118, pl. ii, Feb. 1885. Habits of *S. cooperi* at Brookville, Indiana (pp. 113–115).

6. 1892. Merriam, C. Hart.—The Occurrence of Cooper's Lemming Mouse (*Synaptomys cooperi*) in the Atlantic States. <Proc. Biol. Soc. Wash., vii, pp. 175–177, Dec. 22, 1892. Records for New York, Maryland, Virginia, and Roan Mountain, North Carolina.

7. 1893. Rhoads, Samuel N.—A new *Synaptomys* from New Jersey [*S. stonei*]. <Am. Naturalist, xxvii, pp. 53–54, Jan., 1893. Description of a supposed new species.

8. 1893. Steere, J. B.—A List of the Indigenous Mammalia of Michigan. [Reprinted from a newspaper and privately distributed.] *Synaptomys cooperi* recorded as rare at Ann Arbor.

9. 1894. Bangs, Outram.—*Synaptomys cooperi* Baird in Eastern Massachusetts, with Notes on *Synaptomys stonei* Rhoads, especially as to the Validity of this Species. Proc. Biol. Soc. Wash., ix, pp. 99–104, April 14, 1894. *S. stonei* stated to be the same as *S. cooperi.*

10. 1894. True, F. W.—Diagnoses of new North American Mammals. <Proc. U. S. Nat. Mus., xvii, pp. 241–243, 1895. Advance sheets issued April 26, 1894. Original description of genus *Mictomys* and of *Mictomys innuitus* (pp. 242–243).

11. 1894. Allen, J. A.—Recent Progress in the Study of North American Mammals. <Proc. Linn. Soc., New York. Author's edition issued July 20, 1894. Recent records of *S. cooperi* summarized (pp. 16–17).

12. 1894. Allen, J. A.—Remarks on a second Collection of Mammals from New Brunswick. <Bull. Am. Mus. Nat. Hist., New York, vi, art. xviii, pp. 359-364. Author's edition issued Dec. 22, 1894. *S. cooperi* recorded from Victoria County, N. B. [Specimens prove to be *S. fatuus* Bangs, subsequently described.]

13. 1895. Rhoads, Samuel N.—Notes on the Mammals of Monroe and Pike Counties, Pennsylvania. <Proc. Acad. Nat. Sci., Phila., for 1894, pp. 387–396, Jan., 1895. *S. cooperi* recorded from Monroe County, Pa. (p. 391).

14. 1896. Bangs, Outram.—On a small Collection of Mammals from Lake Edward, Quebec. <Proc. Biol. Soc. Wash., x, pp. 45–52, March, 1896. Original description of *Synaptomys fatuus* (pp. 47–48).